

CLAIMS

1. A method of calibrating base stations in a wireless telecommunications network to Global Positioning System (GPS) time, said method comprising:

5 computing base station timing offsets from position measurement data obtained from one or more hybrid mobile stations during regular position location sessions, wherein position measurement data includes GPS pseudorange measurement data and position measurement data based on propagation delay for signals transmitted between the hybrid mobile stations and the base stations.

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2. The method as claimed in claim 1, wherein calibration data for calibrating the base stations to GPS time is not obtained externally from any calibration instrument for input into the wireless telecommunications network.

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3. The method as claimed in claim 1, which includes performing the base station calibration on a substantially continuous basis to compensate for any disturbances in the base stations.

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4. The method as claimed in claim 1, wherein collection of the position measurement data from the hybrid mobile stations occurs only when the hybrid mobile stations place or answer wireless telephone calls.

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5. The method as claimed in claim 1, wherein the base stations provide GPS acquisition data to the hybrid mobile stations.

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6. The method as claimed in claim 1, which includes excluding position measurement data based on propagation delay for signals transmitted between the hybrid mobile stations and the base stations when there is a substantial likelihood of significant propagation delay caused by multipath propagation.

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7. The method as claimed in claim 1, which includes excluding position measurement data based on propagation delay for signals transmitted between at least one of the hybrid mobile stations and at least one of the base stations when distance between said at

least one of the base stations and said at least one of the hybrid mobile stations exceeds a certain distance.

8. The method as claimed in claim 1, which includes excluding position measurement
5 data based on propagation delay for signals transmitted between at least one of the base
stations and at least one of the mobile stations when strength of the signals transmitted
between said at least one of the base stations and said at least one of the mobile stations
is less than a certain signal strength.

10 9. The method as claimed in claim 1, which includes excluding a GPS position
determination of at least one of the hybrid mobile stations when redundant GPS position
fixes cannot be computed from pseudorange measurements from at least five GPS
satellites.

15 10. The method as claimed in claim 1, which includes excluding a GPS position
determination of at least one of the hybrid mobile stations when there is more than a
certain level of average residual error in measured pseudoranges from at least five GPS
satellites.

20 11. The method as claimed in claim 1, which includes collecting statistics of base station
timing offset, and based on the collected statistics, computing an averaged lower bound
on computed base station timing offset in order to reject base station timing
measurements related to multipath error.

25 12. The method as claimed in claim 11, which includes rejecting a base station timing
offset measurement that is more than a certain number of standard deviations greater
than a mean base station timing offset.

30 13. The method as claimed in claim 1, which includes installing or modifying at least
one of the base stations, and excluding use of signals from said at least one of the base
stations for position determination of mobile stations in the telecommunications network
until said at least one of the base stations has been calibrated by using position
measurement data obtained from one or more hybrid mobile stations during regular

position location sessions.

14. The method as claimed in claim 13, which includes determining that said at least one of the base stations has been calibrated when the calibration data is observed to have
5 stable statistics.

15. A method of calibrating base stations in a Code Division Multiple Access (CDMA) wireless telecommunications network to Global Positioning System (GPS) time, said method comprising:
10 computing base station offsets from position measurement data obtained from one or more hybrid mobile stations during regular position location sessions, wherein the position measurement data includes GPS code phase data expressed relative to mobile station system time.

15 16. The method as claimed in claim 15, which includes performing the base station calibration on a substantially continuous basis to compensate for any disturbances or drift in the base stations.

17. The method as claimed in claim 15, wherein the collection of the position
20 measurement data from the hybrid mobile stations occurs only when the hybrid mobile stations place or answer wireless telephone calls.

18. The method as claimed in claim 15, wherein the base stations provide GPS acquisition data to the hybrid mobile stations.

25 19. The method as claimed in claim 15, which includes installing or modifying at least one of the base stations, and excluding use of pilot signals from said at least one of the base stations for AFLT position determination of mobile stations in the telecommunications network until said at least one of the base stations has been
30 calibrated by using position measurement data obtained from one or more hybrid mobile stations during regular position location sessions.

20. A method of calibrating base stations in a Code Division Multiple Access (CDMA)

wireless telecommunications network to Global Position System (GPS) time, said method comprising:

- computing base station timing offsets from position measurement data obtained from one or more hybrid mobile stations during regular position location sessions,
- 5 wherein the position measurement data includes GPS pseudorange measurement data and Advanced Forward Link Trilateration (AFLT) position measurement data,
 - wherein the base station calibration is performed on a substantially continuous basis to compensate for any disturbances in the base stations,
 - wherein the collection of the position measurement data from the hybrid mobile
- 10 stations occurs only when the hybrid mobile stations place or answer wireless telephone calls, and
 - wherein the base stations provide GPS acquisition data to the hybrid mobile stations.

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